

# EXHIBIT A

## FEDERAL COMMUNICATIONS COMMISSION WASHINGTON, D.C. 20554

January 23, 1997

Lucinda Grant  
Electrical Sensitivity Network  
P.O. Box 4146  
Prescott, AZ 86302

Dear Ms. Grant:

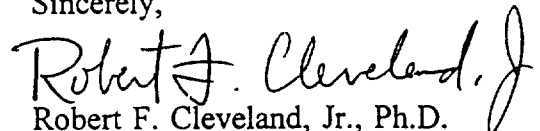
Your letter of September 19, 1996, to Reed E. Hundt, Chairman of the Federal Communications Commission (FCC), was forwarded to this office for a response. Your letter related the concern you have over the future proliferation of telecommunications services and the effect this may have on individuals who are "electrically sensitive."

The FCC recently adopted guidelines for evaluating human exposure to radiofrequency (RF) emissions from FCC-regulated telecommunications sources (61 Fed. Register 41,006, 1996). These guidelines were based on recommendations made to the FCC by the various agencies of the U.S. Government which are responsible for human health and safety. These agencies include the Environmental Protection Agency (EPA), the Food and Drug Administration (FDA), the National Institute for Occupational Safety and Health and the Occupational Safety and Health Administration. All of these agencies have expressed their support for our guidelines and their appropriateness for protecting human health.

Since the FCC is not a health and safety agency, we have neither the jurisdiction or the resources to investigate the biological effects you describe. We must rely upon the agencies mentioned above for advice and guidance in such areas. Therefore, if you have evidence for harmful biological effects for which our guidelines do not provide protection, it is appropriate that you take this up with the agencies mentioned above, particularly the EPA and the FDA.

I hope that this information will be helpful. If you have any further questions please write this office directly, or you can call our RF Information Line at: (202) 418-2464.

Sincerely,



Robert F. Cleveland, Jr., Ph.D.  
Office of Engineering & Technology  
Federal Communications Commission

cc. R. Engelman

Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, DC 20554

RECEIVED

NOV 25 1997

In the Matter of )

FCC MAIL ROOM

)  
Preemption of State and Local )  
Zoning and Land Use Restrictions )  
on the Siting, Placement and )  
Construction of Broadcast Station )  
Transmission Facilities )

MM Docket No. 97-182

COMMENTS OF THE CELLULAR PHONE TASKFORCE

Among all federal objectives, that of protecting the public health and welfare is paramount, and indeed is the foremost reason for the existence of government at all. The allegations of the Cellular Phone Taskforce<sup>1-16</sup> and of the Electrical Sensitivity Network<sup>17,18</sup> that microwave radiation in general, and pulsed radiation in particular, are injuring

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<sup>1</sup> Petition for Reconsideration, ET Docket No. 93-62, Aug. 30, 1996

<sup>2</sup> Reply to Comments of AT&T Wireless Services, Inc., ET Docket No. 93-62, Oct. 15, 1996

<sup>3</sup> Complaint of discrimination on the basis of handicap, Feb. 2, 1997

<sup>4</sup> Petition for Reconsideration, ET Docket 93-62, Feb. 17, 1997

<sup>5</sup> Comment on CTIA's Petition for Declaratory Ruling, DA 96-2140, Feb. 26, 1997

<sup>6</sup> Comment on the second set of joint preliminary draft proposals for WRC-97, March 23, 1997

<sup>7</sup> Reply to Comments of Ameritech Mobile Communications, Inc., ET Docket 93-62, April 4, 1997

<sup>8</sup> Reply to Comments of AT&T Wireless Services, Inc., ET Docket No. 93-62, April 7, 1997

<sup>9</sup> Petition for Partial Reconsideration, IB Docket No. 95-91, April 9, 1997

and killing large numbers of citizens and irreperably damaging the environment because of the speedy rollout of new technologies which the Congress has mandated and the Commission is aggressively implementing, must, if true, supersede any interest anybody has in converting analog communication systems to digital. It has never been the policy of the United States government that human beings are expendable. Indeed the voluntary taking of human life, by direct or indirect consequence of actions, is the most serious crime recognized in our society. The Commission and the telecommunications industry have been aware of our allegations since August 30, 1996. The Commission's only

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<sup>10</sup> Comments on Further Notice of Proposed Rulemaking, IB Docket No. 95-91

<sup>11</sup> Reply to Oppositions, IB Docket No. 95-91, May 16, 1997

<sup>12</sup> Comments on Proposed Rule, IB Docket No. 97-95, April 28, 1997

<sup>13</sup> Reply Comments, RM-9096, Aug. 9, 1997

<sup>14</sup> Comment to the Petition for Declaratory Ruling of the Cellular Telecommunications Industry Association, DA 96-2140, Sept. 9, 1997

<sup>15</sup> Appeal of the denial of Complaint of Discrimination on the Basis of Handicap, Oct. 6, 1997

<sup>16</sup> Comments, WT Docket No. 97-197, Oct. 6, 1997

<sup>17</sup> Attachment to Reply to Comments of AT&T Wireless Services, Inc., ET Docket No. 93-62, Oct. 15, 1996

<sup>18</sup> Reply Comments, RM-9096, Aug. 15, 1997

response thus far has been a denial of jurisdiction<sup>19,20</sup> and a failure to refer the matter to the appropriate health and environmental agencies as required by law--required because the whole basis of the preemption powers claimed by the Commission is the possession of such jurisdiction, according to Section 704(a) and (b) of the Telecommunications Act of 1996.

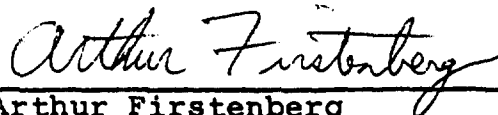
The speedy rollout of national digital television broadcast service must therefore be immediately halted because it conflicts with more important federal objectives, namely the protection of the health of the citizenry. The preemptions requested by the National Association of Broadcasters and the Association for Maximum Service Television and proposed by the Commission must be denied in their totality.

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<sup>19</sup> "Since the FCC is not a health and safety agency, we have neither the jurisdiction or the resources to investigate the biological effects you describe. We must rely upon the agencies mentioned above for advice and guidance in such areas." - Letter from Robert F. Cleveland, Jr., Office of Engineering & Technology, to Lucinda Grant, Electrical Sensitivity Network, Jan. 23, 1997, attached as Exhibit A to the Cellular Phone Taskforce's Comments in WT Docket No. 97-197, Oct. 6, 1997.

<sup>20</sup> "We reiterate that these guidelines are based on recommendations of expert organizations and federal agencies with responsibilities for health and safety." - Paragraph 31 of the Second Memorandum Opinion and Order in ET Docket No. 93-62, Aug. 25, 1997

Respectfully submitted,

A handwritten signature in cursive script that reads "Arthur Firstenberg". The signature is written in dark ink and is positioned above a horizontal line.

Arthur Firstenberg  
President, Cellular Phone Taskforce  
Post Office Box 100404  
Vanderveer Station  
Brooklyn, New York 11210  
(718) 434-4499

October 28, 1997

September - October 1996

Vol. 1, No. 5

## *Human Sensitivity to Electric Fields*

Clarence W. Wieske

(Editor's note: This article is reprinted from the Proceedings of the First National Biomedical Sciences Instrumentation Symposium, held in Los Angeles, California, July 14-17, 1963. Reprinted with permission. Copyright © 1963 Instrument Society of America. From Biomedical Sciences Instrumentation, Proceedings of the First National Biomedical Sciences Instrumentation Symposium, Volume 1.)

### ABSTRACT

This paper is more of a chronicle of the author's encounter with quite a revolutionary finding. It deals with the cause of low frequency, low energy AC fields and their effect on some persons. The work done to locate the source and reduce the fields is outlined. It is pointed out that the human implications and medical and clinical aspects should be of important interest.

While we were in the Biological Sciences Department of the University of California Santa Barbara, we became interested in a noise problem in a newly constructed house. The location was an unusually quiet one, so we decided to look for electric fields first to see if we could trace them to some metal which might be set into vibration by the fields.

To start with, a high gain battery operated tape recorder was used. The microphone was replaced with a pick-up coil or loop. The search coil picked up very strong harmonic frequencies from the 60 cycle electric service, telephone service, gas service, water service and metal in the heating system. A contact type stethoscope was then used in the strongest field area to find out if any metal was

vibrating. There were no audible vibrations of these frequencies.

The woman of the house was the only one bothered by the noise. She described the same noise I was hearing on my pick-up loop! The "impossible deduction" was made that perhaps this woman could hear these alternating current fields without conversion to audible sound waves. A simple test was made. The tape recording was played back into the coil used for pick-up instead of the headphones. She instantly remarked, "You mean you cannot hear that?" No audible sound could be detected coming from the coil, yet she could hear it! A second test was made. I connected a low power sweep frequency generator to the water pipe and another ground, both about 100 feet from the house. I did not tell her this, but she remarked that there was a peculiar noise like a barking dog. I turned on the pick-up equipment in the house and heard the same signal from the generator. The description was accurate as it did sound like a barking dog! There was not enough power to vibrate metal in the house, and there was no possibility of an audible signal reaching the house. The places she indicated as the noisiest and quietest were checked and verified with the equipment.

A test of this person was set up at a seminar at the University. A special audiometer test was devised to try to prove the sensitivity and frequency range under controlled conditions. Instead of the regular headphones, a pair of coils were made to place over the subject's ears and the signal was fed to the coils. When she entered the seminar room, she said the noise was extremely bad. The electro-

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**WARNING:** Environmental illness is a complex topic.

Methods or treatments that benefit some people may harm you. Readers are advised to consult appropriate medical, legal, or other professionals for personal guidance prior to making changes in their current program.

magnetic search coil did not indicate very strong magnetic fields. When the subject placed the coils over her ears, and when the audiometer was turned on but the key left open, she said the noise from the coils was intense. Because of this high background noise tests could not be made. In fact, a control subject could hear a small amount of audible tone from loose coil turns vibrating. She could not (do) this because of the field background.

The last test was for sensitivity to electrostatic fields. It had been assumed at this time that electromagnetic fields would be the most logical as they would penetrate the body. When the subject was placed between two metal sheets and AC voltages were fed to them, she was able to correlate them with on and off. However it was not possible to avoid a very weak audible signal from the metal as they acted as a weak electrostatic speaker.

If the subject could not hear the weak audible signal because of the strong background electrical noise, we might assume that she was most sensitive to about 3000 cycles from this test.

A later checking of the troubles at the demonstration revealed what had happened. The trouble was that the subject was also sensitive to electrostatic field conditions. An electrostatic probe consisting of a metal disk on the end of a polystyrene rod was connected to the amplifier. In checking the lecture hall, the probe picked up very strong electrostatic fields mostly from a large number of fluorescent lamps. The coils connected to the audiometer were checked with the probe and it was found that they were radiating a very strong electrostatic field including the noise from the masking oscillator in the audiometer, even though the masking oscillator switch was not closed. The coils were delivering the masking noise electrostatically because they were not shielded and grounded.

The new probe was taken to the house, and in going over the house a different pattern was presented. All the AC operated equipment in the house had these electrostatic fields about them. The telephone was also radiating. For some years the subject at times has been able to answer the phone before it rang. The probe was tried during an incoming call and it was found that the phone radiated connection noises just before it rang! At times, she has heard phone conversation when near the wires. She was able to hear tape recorded music fed to a loop of wire on the floor. She also said that at times she could hear extremely high pitched Morse code. A long wave marine receiver was obtained and it was found that she was hearing propagated radio waves from long wave low frequency stations.

These are continuous wave, unmodulated stations with a carrier in the audio frequency spectrum around 15,000 cycles.

Realizing that electrostatic fields are easily shielded with grounded metal shields, an experiment was tried. A ground wire was brought into the house and a sheet of aluminum foil was placed around the subject's head. As soon as a wire from the foil was connected to the ground wire the noise level dropped. (Editor's note: Warning—Using a house ground in this way that is improperly wired can cause shock or electrocution.) The probe showed the same result. The open wire low voltage secondary of the door chimes was producing a lot of noise in the kitchen. When one side of the low voltage secondary was grounded, the noise level in the kitchen dropped. Grounding the refrigerator and freezer case also helped. Telephone noise was reduced when the wires were shielded.

We investigated a second case almost identical at a home in Monrovia, California. The same kind of conditions were producing strong electrical fields. The woman of the house was the only one hearing them. The same tests revealed that she was less sensitive than the first subject, but the fields in this house were stronger. These two women visited each other with interesting results. When the Monrovia woman visited Santa Barbara, she could hear the noise in this house, but not as strong as in her own home. When the Santa Barbara woman visited Monrovia, she found the noise so bad she had to talk loud to override the background noise. She could only stand it in the house for a short time.

The first woman suffered very much from the effects of these fields. The overall body effect, feeling and pain was worse than the hearing sensitivity. This resulted in much loss of sleep and rest and aggravation of nervous conditions. She became seriously ill with "shingles" which is a nerve ending disease. Her doctor had to remove her from this house for some time to overcome it.

The feeling sensation she had from these fields suggests sensitivity of sensory nerve endings in the skin. The special receptors for pain may be involved. She also described throbbing sensations of a few cycles per second. The equipment revealed sort of beat note pulsations of a few cycles per second.

Determination of the reason for this hearing sensitivity requires much research. Some simple crude experiments were made. An electrostatic probe in a closed glass tube was connected to a source of variable frequency electrostatic energy. This was used to check teeth and fillings. A small open-core coil with iron core was connected to a

source of audio frequency current to produce limited fields of a few inches. These tests revealed that the teeth did not seem to be the reason for the hearing sensitivity. It was found that the left side of the head was most sensitive. When the subject was ill with the shingles, it was the left side of the face that was most affected by the pain, swelling etc. It would be very interesting to test deaf individuals with the small coil to see if any of them could hear the field. This poses a possibility of a new type of hearing aid that may work when the ordinary type will not.

I have devoted much thought to the problem of the seat of the sensitivity. I have evolved some ideas which I hope to do more work on soon. I would like to take the liberty of making some suppositions.

Someone once said of Tesla, "Because he saw further, he saw first." I think that many truths lie hidden behind barriers that only exist in the mind. I hope that these suppositions will be taken in the spirit in which they are made; that is, to stimulate thinking by those more qualified in these fields.

It may be that the sensitive unit is the nerve endings in the inner ear. The nerve endings in the skin seem to be affected. It may be that it is not necessary to have conversion from electrical energy to mechanical energy to stimulate the hair cells in the cochlea which are connected with the actual nerve fibre endings. These are the sensory end organs of hearing. Maybe the reaction to electrical fields in these tiny organs is on an atomic level. If conversion from electrical to mechanical energy is necessary, there are many transducer systems that could be considered. Some chemical or anatomical difference in some individuals may create transducer properties to some part of the inner ear.

If any part of the mechanical system that transmits the sound pressure waves by mechanical means to the inner ear, for some reason was partly paramagnetic, diamagnetic, or even had piezoelectric properties, they might be acted upon by electrical fields. For instance, the tectorial membrane or "roof" membrane which normally stimulates the hair cells when the fluid in the cochlea is in motion, could be set in motion by fields if it had some of the above properties. Suppose some of the bony material around the cochlea was a sort of dried out spongy mass with loose dielectric material. This might be set into vibration by fields, the sound could travel to the nearby organ of Corti by bone conduction. Maybe these fields induce tiny currents in the inner ear, and these currents stimulate the hair cells or even the nerves going to the brain. I think the last

possibility is the most plausible so I would like to go into it in more detail.

According to the membrane theory, the nerve fibre is polarized with negative ions on the inside and positive ions on the outside. The membrane is semi-permeable to these ions. If the membrane semi-permeability breaks down, the polarization breaks down. If the polarization breaks down, the semi-permeability breaks down. In either case, the breakdown is progressive along the nerve, and this is the nerve impulse. The recovery of the semi-permeability and polarization along the nerve follows behind the nerve impulse, and the nerve becomes ready for another stimulation. Any current reaching the nerve will depolarize a region and start the impulse to the brain. If the nerve for some reason in some individuals is not as well insulated from these currents as in the normal individual, or if the cochlea is not as well insulated from these currents in some individuals, perhaps this could make them sensitive to these electrical fields. This theory would also help to explain the three types of sensitivity as electromagnetic fields can induce electric currents in the tissues; electrostatic fields can cause currents by movement of charges; propagated radio waves can induce currents as they pass through the body. If these currents activate nerves in some people, they could cause suffering as this woman has suffered. Perhaps many more are suffering from these effects.

When you consider the electrical make-up of man and the continuously increasing fields we are subjected to, it seems more reasonable to me that this phenomenon would occur rather than not occur. I believe there could be an increasing incidence rather than an isolated few.

In April 1963 I received a letter from a woman in Brooklyn, New York. She has been trying to find help in a case like this. She described the same sort of trouble that the other two women had. I sent her instructions for some tests, a tape of the noises and some questions to answer. From the answer to the questions and tests, I believe she may possibly be another sensitive person. She said that the recorded noise was what she heard.

I recently talked to nurses that had worked in mental institutions. They described patients who were always complaining and trying to get away from the terrible noise. Cotton in their ears did no good but certain rooms or areas were more quiet for them. I believe that it may be possible that some people may have been driven to these institutions because of the unbearable noise and other effects, if they are sensitive to the fields. Maybe we are putting them in a worse field area. Maybe they



could be helped by finding out if they are sensitive and if they are, placing them in a field free area may help their condition. I believe this is a vital thing to consider in this age of increasing mental conditions.

- Part One of Two -

## ***One of Seven Sensitive to Electrical Fields***

(Editor's note: The following article is reprinted from the English Edition of *Forskning & Praktik*, 4/1992, published by the National Institute of Occupational Health, 171 84 Solna, Sweden.)

More than one employee in seven was hypersensitive to electrical fields. The most common symptoms (after skin problems) were ear-nose-throat complaints, followed by eye problems and nervous disorders. More than 80 percent reported that they were bothered by computer display screens. Next on the list was electrical equipment. Almost one in five attributed the problems to amalgam fillings.

These are the preliminary results of a survey of 731 employees at five major Swedish workplaces. The project is funded jointly by the employers and the Work Environment Fund.

The study is led by Professor Bengt Knave, M.D., of NIOH's Division of Neuromedicine in Solna, and is being made in collaboration with the psychiatric clinics at Huddinge and St. Görans hospitals in Stockholm, the National Institute of Radiation Protection, and the National Telecommunications Administration.

These figures are not representative of Sweden's entire working population. The companies participating in the study are doing so because their employees had complaints. But the numbers are surprisingly high, nevertheless.

The project has been designed in three stages. In the first stage, a questionnaire was used to identify employees that were hypersensitive to electrical fields and to choose controls. On the basis of the questionnaire, the scientists characterized 99 of the 731 respondents as "cases of hypersensitivity to electrical fields." A somewhat larger proportion, 15 percent, were classified as uncertain cases or "non-cases," which did not clearly belong in either the hypersensitive or the control group. These "uncertain cases" were concentrated to two of the workplaces, where they accounted for every fourth or

fifth subject.

In the second stage of the project, which is taking place in 1992, the workplaces will be surveyed for factors that may affect health and the hormone melatonin will be monitored in employees' urine. Two more questionnaires, on such factors as personality, work environment and living conditions, are also included in this stage. By comparing the hypersensitive subjects to the controls, the researchers hope to get a better picture of the reasons for the hypersensitivity.

In the third stage, the researchers will develop corrective measures: both improvements at the workplace and individual therapies and treatments for people who are hypersensitive to electrical fields.

### **No simple explanation**

So far, scientists have not been able to supply a simple, acceptable explanation for why electricity makes people sick. The fields around a computer display screen are normally so weak that they can hardly affect a nerve cell.

Several hypotheses have been tested, but they have not been confirmed by either epidemiological studies or experiments. Researchers are increasingly of the opinion that hypersensitivity to electricity, like most other illnesses, must be seen against a background of numerous factors, perhaps a combination of physical, chemical, technological, physiological, biological and psychosocial conditions.

"There is no reason to assume that hypersensitivity to electrical fields should be an exception to this rule," explains Knave, and adds: "Electromagnetic fields can not be excluded from the list of conceivable explanations. The hypersensitive persons' testimony about when they feel affected, and provocation studies in which researchers have found suspected correlations with extremely weak fields, indicate that this line of research must be followed up."

The number of people who are hypersensitive to electrical fields has grown in recent years. Victims have banded together in an interest association, which now has a couple of thousand members. According to some sources, there may be 10,000 to 20,000 Swedes who are hypersensitive to electricity.

Hypersensitivity to electrical fields was initially dismissed as an exclusively Swedish ailment, but similar symptoms have since been reported in other European countries as well as the United States.

### **The victim's version**

Hypersensitivity to electricity does not scientifi-

# ELECTRICAL SENSITIVITY NEWS

*An international newsletter about the latest environmental illness—electrical sensitivity from electromagnetic fields*

November - December 1996

Vol. 1, No. 6

## *A Letter to New York City*

Marjorie Lundquist, Ph.D., C.I.H.  
Bioelectromagnetic Hygienist

(Editor's note: This article is an excerpt from a letter dated August 9, 1996 that Dr. Lundquist sent Ralph Balzano, Commissioner at the Department of Information Technology and Telecommunications for New York City. The letter was prompted by the City's proposal to install cellular phone antennas on lampposts throughout New York City. Marjorie Lundquist, Ph.D., C.I.H., is a certified industrial hygienist with a Ph.D. in physics. Her booklet "Cellular Telephones and Cellular Towers: Guidelines for Cancer Prevention" may be ordered directly from her at PO Box 11831, Milwaukee WI 53211-0831; cost \$8.95. Copyright © 1996 by Marjorie Lundquist. Reprinted by permission.)

It has recently come to my attention that New York City is planning to lease its lampposts to cellular telephone companies for use as fixed transmitter sites—and expects to increase its annual revenue by about \$3 million as a result. This is a very imaginative idea; it represents the kind of "value-added" thinking that cities certainly need if they are to take full advantage of the opportunities that the future presents.

Still, imaginative new ideas do require careful consideration, in order to make sure that there are no hidden liabilities associated with them. I perceive several that might result from this plan. The purpose of this letter is to share them with you.

One has already been brought to your attention: it is possible—indeed, it seems very likely—that fixed cellular telephone transmitters mounted on city lampposts will be so close to passenger traffic along

sidewalks and streets that individuals who are *electrosensitive* will not be able to walk the streets without experiencing discomfort, if not outright illness!

Related to this is another possibility that probably has *not* previously been brought to your attention: inescapable exposure to the electromagnetic fields in the vicinity of these cellular telephone transmitters may "sensitize" susceptible individuals in the "normal" population, thereby causing them to *become* electrosensitive!

If you are not familiar with electrosensitivity, you are probably wondering just what this is. Basically, it is the condition of being hypersensitive to non-ionizing electromagnetic fields (EMF). The reaction may vary, depending on the frequency and other features of the electromagnetic fields encountered, but headache and nausea are fairly common symptoms. The complete set of symptoms suffered by some individuals may be disabling—even life-threatening—while others may suffer only a mild effect...

No one knows exactly what causes electrosensitivity, but exposure to an unusual electromagnetic field (EMF) is usually involved. Its onset can be quite sudden, occurring within hours after exposure to the precipitating EMF. Once electrosensitivity is triggered, it persists. I have encountered only one individual who claims to have reversed his electrosensitivity and returned to normal. Electrosensitive people typically remain electrosensitive indefinitely—at the present time, at least.

If you consult a physician, you will probably be told that there is no such disease as "electrosensi-

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tivity" recognized by the medical profession. This is correct for two reasons: electrosensitivity is *not* a disease, but a condition (like "being allergic" or "having an infection"); and only physicians who have specialized in that branch of medicine known as "environmental medicine" are likely to have any experience with it. As a result, most physicians are not familiar with electrosensitivity, the result being that many electrosensitives have been given erroneous psychiatric diagnoses by physicians unfamiliar with their problem.

Many physicians doubt the existence of such a condition as electrosensitivity, but this merely indicates their ignorance of it. Electrosensitive individuals have no doubt whatsoever as to the reality of their condition—and most of them devoutly wish such a condition did *not* exist!

I first became acquainted with this condition about two years ago, when someone suffering from it sought my help. Since then I have become acquainted with other electrosensitives; they exist around the world. There have been two international conferences held on this subject to date, the Proceedings of which are available for purchase.

You have been told that, to prevent the fixed transmitters of cellular telephones from exerting a disabling effect on electrosensitive individuals, they should be situated more remotely from people. This is quite correct. Placement on building rooftops is common, and—so far as I am aware—this has not created a problem.

There is a third possibility that could manifest itself, over time. You are probably aware that some people suspect that the use of cellular telephones can produce brain cancer in the user. While there is no conclusive proof of this in the scientific sense, the data are quite suspicious and there is a good deal of indirect supporting evidence.

There has been no similar association of any kind of cancer with proximity to the *fixed* transmitters of cellular telephone systems, however, and their EMFs ought to be carcinogenic also, if those of the hand-held cellular phones are. The reason that there has been no association of cancer with proximity to fixed cellular telephone transmitters, I feel sure, is that these transmitters are typically *remotely* situated, and have therefore been sufficiently far from the areas regularly occupied by people that there has been little opportunity for human exposure to the *near fields* of these transmitters.

The same cannot be said for self-contained hand-held cellular telephones themselves. These have a transmitter in the handset, which is placed beside the head during use. Unquestionably, brain tissue

close to the transmitter—that is, brain tissue just under the skull, behind the ear of the user, on the same side of the head that the telephone is used—is exposed repeatedly to the *near field* of the handset's transmitter. And it is in just this part of the brain that cancer has been found in heavy cellular telephone users, a few years after they began using a cellular telephone! (This subject is discussed at some length in my publication titled ***Cellular Telephones and Cellular Towers: GUIDELINES FOR CANCER PREVENTION.***)

In planning to lease sites for fixed cellular telephone transmitters on city lampposts, you are proposing to abandon the benefits and protections of remote location, and bring these hazardous devices into fairly close proximity to the people who live and work in New York City. Over time, an increase in the incidence of cancer is likely to result, if the lamppost location is too close to populated areas for safety...

I have tried to indicate in this letter the kinds of liabilities—legal, financial, labor relations—that can be predicted to accompany a decision to place fixed cellular telephone transmitters on city lampposts. I have also tried to indicate what action the City can take to try to evaluate and quantitate these problems, so that its final decision is an *informed* one.

Be assured that the \$3 million annual revenue the City of New York expects to receive in lease fees will be offset, at least partially, by some expenses that otherwise would not have been incurred. It would be prudent for you to try to determine, *before* you commit the City of New York irrevocably to this human health effects experiment, what the likely costs to the City might be. Remember that the *least expensive* way to solve a problem is to *prevent it from ever occurring at all!*

Good luck with your experiment!

## ***Nervous System and Cardiovascular Effects***

R. Timothy Hitchcock, M.S.P.H., C.I.H. and  
Robert M. Patterson, Sc.D., C.I.H. - USA

(Editor's note: This article is reprinted from the book **Radio-Frequency and ELF Electromagnetic Energies: A Handbook for Health Professionals** by R. Timothy Hitchcock and Robert M. Patterson. Copyright © 1995 by Van Nostrand Reinhold. Reprinted by permission of the publisher, Van Nostrand Reinhold,

Effects associated with the nervous and the cardiovascular systems have been combined, because this is consistent with the approach taken in many human studies, especially Eastern European clinical studies. These have indicated that some RF/MW (radio frequency/microwave)-exposed workers (approximately 30 MHz to 300 GHz) report the occurrence of certain nonspecific symptoms associated with the nervous system, with clinical signs extending to the cardiovascular system (Dodge 1969). These signs and symptoms include headache, nervousness, fatigue, irritability, insomnia, loss of appetite, dizziness, emotional instability, depression, memory loss, thyroid enlargement, sweating, tremor of extended fingers, loss of sexual drive, and impotence (Dodge 1969; Silverman 1973, 1985; Sadcikova 1974; Baranski and Czerski 1976). Collectively, these symptoms and signs are combined into three syndromes that have been viewed as stages in a progressive disease called "radiowave illness" or "microwave sickness or disease" (Dodge 1969; Sadcikova 1974; Glaser and Dodge 1982). Typically, the effects associated with the early stages of microwave sickness are reversible if exposure is discontinued (Healer 1969; Sadcikova 1974; Silverman 1980). The early phase of microwave sickness is called the neurasthenic or asthenic syndrome. This is marked by fatigue, emotional changes, and minor cardiovascular changes (Dodge 1969). The second general clinical syndrome is neurocirculatory asthenia, a vascular dysfunction via neural responses that increases or decreases heart rate and blood pressure, with changes in the electrocardiogram. The third stage is the diencephalic syndrome which involves insomnia, hallucinations, inhibition of sexual function, and a transient loss of consciousness (Dodge 1969; Silverman 1973).

Early reports of microwave sickness were met with skepticism by Western scientists (Dodge 1969; Healer 1969). A few of the reasons for this will be discussed here but only briefly. The signs and symptoms associated with microwave illness were characterized during workplace surveys that lacked appropriate design elements, or adequate documentation of the methods, and relied too heavily on reported subjective complaints. When documented, some of the methods applied by Russian clinicians were unique and unfamiliar to Western scientists. The most frequently reported signs and symptoms were largely non-specific, i.e., they were not necessarily distinctly connected with the work environment, and they could be as easily associated with

life-style or common clinical disorders as with RF exposure. In some cases, symptoms were of such general nature that most workplace stressors, whether exposure to a chemical or physical agent or a stressful job, could be associated with their production. Symptoms were reported at levels less than those viewed as safe in the West, around 10 mW/cm<sup>2</sup>, and often less than 1 mW/cm<sup>2</sup> (Dodge 1969; Marha 1971; Sadcikova 1974; Baranski and Czerski 1976). Fundamentally, Western scientists had taken a different approach in studying health hazards associated with RF. In the United States few results from workplace surveys were available, with a much greater reliance being placed on the outcome of studies with test animals.

Dodge (1969) and Healer (1969) examined the European and Russian reports, reaching a similar conclusion, that the reports had excluded a good deal of information that would make them easier to interpret and, presumably, more believable. Even so, the large number of reports and the consistency of their findings demanded attention. In fairness to Eastern European scientists of the day, reports by U.S. researchers of the same time period show that they generally do not include information necessary to meet the rigorous scientific standards suggested by Dodge earlier.

Baranski and Czerski (1976) reviewed this dilemma in international health science from an Eastern European perspective. They suggested that some differences may have been caused by difficulties in translation of pertinent literature. In regard to field studies, they state that Eastern European scientists "analyze working conditions very carefully, taking such factors as air temperature and humidity, noise, and lighting into account." The major limitation of all human studies is the absence of adequate exposure information and dose estimates. In recognition of the difficulties in collecting accurate, long-term exposure information, Baranski and Czerski submitted that the best available method is to group workers receiving occupational exposure by a reasonable intensity range, as has been done in a number of studies (Czerski, Siekierzynski, and Gidynski 1974; Sadcikova 1974).

In summary, although the Eastern European and Russian reports were numerous and relatively consistent in their findings, they did not include the methods and documentation that are necessary for acceptance in the West. Combine this with a language barrier and the mistrust that accompanied the Cold War era, and you have a dilemma. Microwave illness as a quantifiable clinical disease is not recognized in the West. This may be supportable from the

standpoint of peer review of the scientific methodology of early studies, but that does not diminish the need to define target populations and study designs appropriate to test hypotheses dealing with neurologic effects in humans. Although this has not occurred, the controversy over low-level effects and differences in human exposure criteria did lead to a recognition of the need to harmonize international understanding of RF bioeffects. What evolved was a cooperative agreement between U.S. and Eastern European and Russian governments, which fostered an exchange of technical information and personnel, international workshops, parallel studies, and numerous technical publications. For further information, the interested reader is directed to the following references: Healer 1969; Dodge 1969; Michaelson and Dodge 1971; Silverman 1973; Baranski and Czerski 1976; Dodge and Glaser 1977; McRee 1980; Glaser and Dodge 1982; and Mitchell 1985.

The occupational group that has received the most attention is MW workers. Other groups that have been examined for neurologic effects include physical therapists, plastics welders, and TV and radio workers.

(Editor's note: Please consult the source for specific references cited.)

## ***Microwave Sickness***

Lucinda Grant

On August 6, 1996, the Federal Communications Commission (FCC) adopted U.S. radiation standards for transmitters operating in the 300 kHz to 100 GHz frequency range as required by the Telecommunications Act of 1996.<sup>1</sup> This transmission range includes both radio and microwave frequencies for wireless phone and satellite communications systems. Table 1 from the Federal Register summarizes the exposure limits for each frequency. (See page 5.) This table does not apply to portable devices, i.e. phones.

For the general public, the exposure limit for the 1500 MHz - 100,000 MHz (microwave) range is 1mW/cm<sup>2</sup>; for the 300 MHz - 1500 MHz range, the exposure limit is calculated as a function of the frequency, not to exceed 1mW/cm<sup>2</sup>. These exposure limits become important as we explore health effects research of Soviet and East European scientists.

## **Soviet Studies**

In 1960 the Academy of Medical Sciences USSR published an overview of human and animal research called **The Biological Action of Ultrahigh Frequencies** identifying effects of UHF (historically, frequencies above 300 MHz).<sup>2</sup> While the thermal (heating) biological effect of high intensity radio/microwave frequencies is accepted as convention by both Eastern and Western scientists, non-thermal biological effects of various EMF frequencies at lower intensities have not found the acceptance and attention here that Soviet and East European scientists dedicated to these health problems. This oversight has cost us proper acknowledgement of electrical sensitivity (ES) in this country and faces us with the new radiation standards of the FCC.

In the preface of the Soviet overview, one of the editors noted "...special attention has been paid to the problem of the non-thermal action of ultrahigh frequencies." The intensity of UHF at which they found a detectable thermal effect in animals was 10 mW/cm<sup>2</sup>. Their studies in this book are primarily concerned with effects below 10mW/cm<sup>2</sup>.

The human studies of workers exposed to UHF are most revealing. In one study (Sadchikova), 525 workers (men and women) exposed to UHF on the job were divided into three categories depending upon their level of exposure. The majority of them had been employed in that capacity at least four years. A medical evaluation of each worker found a higher incidence of similar symptoms among each group correlating with that group's exposure level. Among workers overall, the most common symptoms they mentioned were headache, fatigue, extreme irritability, and sleepiness at work. The medical evaluation by worker group found these most common symptoms:

- Group 1 - 184 workers (most exposed)
  - history of periodic exposure to UHF up to several mW/cm<sup>2</sup>
  - 73% Bradycardia (heart slowing)
  - 27% Arterial hypotension
  - 20% Fatigue
- Group 2 - 263 workers
  - history of periodic exposure to UHF up to 1mW/cm<sup>2</sup> (Note: 1mW/cm<sup>2</sup> is the continuous maximum exposure limit under the new FCC radiation standards for the U.S. general public.)
  - 39% Headache
  - 37% Thyroid gland enlargement
  - 35% Fatigue

TABLE 1.— LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0 .....	614	1.63	*(100)	6
3.0-30 .....	1842/f	4.89/f	*(900/f <sup>2</sup> )	6
30-300 .....	61.4	0.163	1.0	6
300-1500 .....			1/300	6
1500-100,000 .....			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34 .....	614	1.63	*(100)	30
1.34-30 .....	824/f	2.19/f	*(180/f <sup>2</sup> )	30
30-300 .....	27.5	0.073	0.2	30
300-1500 .....			1/1500	30
1500-100,000 .....			1.0	30

f = frequency in MHz

\* = Plane-wave equivalent power density

**Group 3 - 78 workers**

history of continuous exposure to UHF up to tenths of a mW/cm<sup>2</sup>

- 52% Thyroid gland enlargement
- 38% Bradycardia (heart slowing)
- 36% Headache

**Control group - 100 unexposed workers (teachers)**

- 14% Arterial hypotension
- 14% Thyroid gland enlargement
- 10% Fatigue

In another study, Sokolov and Arievidh examined blood changes of UHF-exposed workers. Workers were divided into the same three types of categories as used prior, based upon their level of exposure. Elevated levels of leukocytes were found among all groups, with the most exposed having a higher incidence:

	Leukocytes Above 7400 Cells Per Cubic Millimeter
Group 1 - 197 workers (most exposed)	31.6%
Group 2 - 132 workers	18.2%
Group 3 - 69 workers	28.9%
Control group - 100 unexposed workers	16.0%

The most exposed group had 29 workers (14.7%) with a leukocyte count above 8000. (An excess number of leukocytes in the blood is one characteristic of leukemia.)

Gel'fon and Sadchikova examined the blood of 57 UHF workers, 47 with a history of constant exposure and 10 with periodic exposure. In 33 of those examined, a high histamine content was found in the blood. The researchers summarized their findings by reporting that constant exposure to UHF fields could cause both an increase in blood histamine

level and in total blood protein level.

Soviet researchers also investigated UHF workers' sensitivity to odors as an indicator of central nervous system disruption from UHF exposure (Lobanova and Gordon). Olfactory sensitivity to tar, camphor, thymol and rosemary were assessed using a control group for comparison. This study found the most UHF-exposed workers had less sensitivity to odors, which they attributed to a decrease in central nervous system excitability due to their history of UHF exposure.

In this book's summary section outlining recommendations for medical assessment of UHF workers, they state "...illness after the influence of UHF is characterized primarily by functional disorders of the nervous and cardiovascular systems, manifested in the development of an asthenic symptom complex, symptoms of vascular hypotension, bradycardia, and dystrophy of the myocardium, and changes in the crystalline lens (cataract) in the case of a considerable intensity of the influence."

The final article within the book, called "Temporary Sanitary Regulations in Work with Generators of Centimeter Waves" (Centimeter waves range between 3-30 GHz; these standards were also recommended for decimeter waves (300-3000 MHz).), outlines these regulations as approved by the Chief State Sanitary Inspector of the USSR, V. Zhdanov, on November 26, 1958:

**"Hygienic Standards"**

The intensity of irradiation at places where workers with generators of centimeter waves are found should not exceed the following maximum permissible values:

- a) in the case of irradiation during the entire working day—no more than 0.01 m watts/cm<sup>2</sup> (10  $\mu$  watts/cm<sup>2</sup>);

b) in the case of irradiation for no more than two hours per working day—no more than 0.1m watts/cm<sup>2</sup> (100  $\mu$  watts/cm<sup>2</sup>);

c) in the case of irradiation for no more than 15-20 min. per working day—no more than 1 m watts/cm<sup>2</sup> (1000  $\mu$  watts/cm<sup>2</sup>), under conditions of an obligatory use of protective goggles." (Please note that the exposure level under item c is the new FCC radiation limit for public exposure 24-hours daily for their lifetime.)

- Part 1 of a series -

### References

1. Federal Register. Vol. 61, No. 153. Wednesday, August 7, 1996, pp. 41006-41019.
2. Letavet, A.A. and Z.V. Gordon, eds. The Biological Action of Ultrahigh Frequencies. USSR: Academy of Medical Sciences, 1960. (English edition by the U.S. Joint Publications Research Service.)

## EMF Diary - Sweden

Leif Södergren

April 29, 1996

### MICROWAVES AND BIRTH DEFECTS?

Agdeposten (newspaper) in Norway writes about officers who have worked on the same torpedo ship whilst exposed to microwaves from the radar on board and also to high frequency radio signals. Two of the children of the officers were born with club feet and another child was born with a deformed hand. (See more below.)

July 4, 1996

### GENETIC DAMAGE FROM MICROWAVES? 82 CASES IN NORWAY. NAVY IS WORRIED.

Svenska Dagbladet (conservative daily newspaper) reports that the Norwegian Navy is checking all 30,000 employees who have worked the last 30 years on Navy vessels.

The whole thing was discovered by accident when two officers who had worked on the same motor torpedo boat "KVIKK" met at the orthopedic clinic in Bergen. They were both there on a similar business—to see their children with clubfeet. They thought this was a strange coincidence and asked around and soon found a third and a fourth until they had found six more children with deformities whose fathers had worked on "KVIKK".

When this became more well known in the Navy,

a total of 82 cases of Navy personnel with deformed children appeared. "We work on the hypothesis that this (the birth defects) has been caused by electromagnetic fields," says head doctor and commanding captain of the Norwegian Navy in Bergen, Jan Helge Halleraker. When this was reported at the NATO meeting in Brussels, it was decided to use radio transmitters at half force on all ships.

Comment: MAYBE THIS IS A WARNING TO US ALL THAT MICROWAVES (ALSO FROM CELLULAR PHONES) ARE NOT AS INNOCENT AS WE ARE LED TO BELIEVE! Norway is a small and very open country. Do we have similar incidents elsewhere? It was only discovered by accident in Norway when two men met at the same hospital...

(Editor's note: Paul Brodeur's 1977 book *The Zapping of America* outlined incidents surrounding the finding that seventeen children with congenital clubfoot were born within a two-year period at Fort Rucker, Alabama, a U.S. Army helicopter training center with much radar. Other high rates of birth defects reported there included cleft palate and heart problems. This cluster was never fully investigated.)

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## Human Sensitivity to Electric Fields - Part 2

Clarence W. Wieske - USA

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### SOURCE OF FIELDS

Now we will explain what we found to be the source of most of these fields in this situation and we will explain what was done to improve the condition.

The method of power distribution is about the same all over. Power is distributed by three phase



alternating current systems. In the area in which we worked, the high tension feeders fed three-phase star connected transformers. The secondary voltage being 4160 volts between any two of the three leads of the star connection and 2400 volts between any one of these three leads and the grounded neutral of the star connection. This is a typical system. One of these three phase leads will go to one area with the grounded neutral and will serve and feed a number of 2400 volt 240-120 volt transformers for subscriber service. They are now called primaries. Another three phase primary and neutral goes to another area and the third goes to another. These areas may be adjacent, overlap, or may be on top of each other. Now you have three areas that have 4160 volts potential between them. They are insulated from each other by the insulation between primary and secondary of each distribution transformer in these different areas. However, there is a certain amount of electrostatic capacity between each primary and secondary of each transformer. In other words, each transformer is a small capacitor or condenser. This capacity is too small to pass much 60 cycle current, but at high frequencies it can pass a lot of current. However, 60 cycles is not a true sine wave in power systems. It is a distorted 60 cycles which means it is a combination of 60 cycles and higher harmonics of 60 cycles. These high frequency harmonics will readily pass through the small transformer capacity between primary and secondary.

We might add at this point that an understanding of this analysis of power distribution harmonic field problems can be of help in any laboratory where interference is affecting certain delicate instrumentation set ups.

The distortion of 60 cycle wave form is the result of many factors. Generators may produce poor waveform or motors on the circuits may cause harmonics because of the air gaps in the armature slots. Transformers may produce harmonics depending upon the degree of saturation of the core. Rectifiers may produce harmonics. Series and mercury street lighting systems can cause troubles.

The even harmonics such as the 2nd, 4th, 6th, etc., are usually not present. There are two types of odd harmonics. The first are the triple-harmonics, or those which are multiples of three; such as, the 3rd, 9th, 15th, 21st, etc. The second are the non-triple harmonics; such as, the 5th, 7th, 11th, etc. These non-triple harmonics flow out on the three phase transmission line and back the same as the fundamental 60 cycle current. They add up to zero. The triple harmonics, 3rd, 9th, etc., add up to three

times the value of the triple harmonic current in each of the three phases. They are called residuals. These voltages act between the three power wires in parallel and ground. In other words, the three wires in parallel as one side of the circuit and the ground or grounded neutral as the other side.

In the star or wye connected transformers with the neutral of the bank grounded, these triple harmonics flow through the neutral ground. However, this ground system will include many other shunt systems such as water pipes and the earth itself which carries part of the currents. These stray currents in pipes set up strong fields because they may be separated from the other conductor by some distance, even forming loops at times.

These triple-harmonic currents are transferred from primary to secondary of the distribution transformer by induction the same as the 60 cycle current. The 240 volt center tap is grounded at the transformer and to the water pipes in the house so one side of the 120 volt circuits in the house is common with the piping and the pipes can carry currents that will set up fields. These triple harmonics on the 2400 volt primaries are seeking a ground return so they are capacity coupled from primary to secondary and into the house where they radiate strong electrostatic fields and the current enters the piping system creating electromagnetic fields. In speaking of these harmonics, we of course do not mean that all of them are present. Only some of these are predominant depending on what is causing them. For instance, the 150th triple-harmonic of 9,000 cycles may be a predominant one in a certain case. In communication work it has been found that these triple, residual, or unbalanced currents can cause as much interference as 40 times the currents in balanced systems, and as much electrostatic interference as 110 times the voltage in balanced systems.

Now let us consider the source of fields which are hardest to track down and analyze. These are the non-triple harmonics which normally circulate from one phase to the other with the 60 cycle power current in a balanced way without ground return. However, they do get into ground paths in the following way. Remember we said that the three phases may go to three separate areas in a distribution system. These three areas are interconnected with common water pipe, gas pipe, or other conductors. Each area is at 4160 volts potential difference because of the electrostatic capacity coupling from primary to secondary of each distribution transformer. The center tap of each secondary is grounded to water pipes in each particular area so the intercon-



necting pipes carry these non-triple harmonic currents between phases. These pipe currents create the fields. Also all grounded objects have an electrostatic field between them and any "hot" wire near them because the ground is common between the phases.

At this point let me illustrate. If you have an ordinary "zip" lamp cord that is connected to a load, you have both 60 cycle and harmonic current passing through it, but little electromagnetic field around it because the conductors are close together. The fields cancel because they are in opposite directions and they envelope each other. One of the cord wires is also at ground potential so the electrostatic field about the "hot" wire is partly shielded by the grounded wire, and there will not be much electrostatic field. Now if you "zip" apart this cord you will have a very different condition. Each separate wire will have a strong electromagnetic field about it.

In a situation where you have these harmonic currents taking a ground or pipe path away from the other conductor, you will have strong fields. If you separate the two zip cord wires, you will be forming a loop. The field will be stronger in the loop because it becomes a single turn inductance coil. Water pipes can also form a large loop around a certain area. If you check these separated wires for electrostatic field, you will find that the "hot" wire is no longer shielded by the grounded wire, and it will be radiating a strong electrostatic field.

In the vicinity of a single three phase primary in one area you will have non-triple electrostatic fields because the ground is common with the earth in another area fed by another phase. The triple harmonic electrostatic fields are present around all three feeders whether they are separated or not because they are in phase on all three with grounded neutral return. Also the electromagnetic fields are stronger because of ground return paths. There are many puzzling conditions if the overall picture is not clear. For instance, an electrostatic probe will seemingly indicate that trees, bushes, and any grounded objects have these electrostatic fields about them. They simply become part of the conducting path through the instrument. In checking fields around buried pipes for instance, we have come to a "T" with one pipe branching into two. One pipe would have a very different sound than the other. One branch would be conducting mostly non-triple currents between two different phase areas, and the other mostly triple harmonic currents to a three phase neutral ground somewhere. The third would have both.

## REDUCING FIELDS

Some of the measures taken to reduce the noise level in the house will now be given. The kitchen was the noisiest room so that was investigated first. Electrostatic fields were strongest. The open wire low voltage door chime wires in the attic were radiating strong electrostatic fields because they acted as an antenna or an ungrounded radiating surface. This radiator was coupled to the source of harmonic voltages through the primary to secondary capacity coupling in the bell transformer. Grounding one side of the low voltage stopped this. Grounding all electrical equipment such as the freezer box removed more. The telephone was also bringing in noise so with the cooperation of the telephone company, the entrance wires were replaced with shielded wires which helped more. Ungrounded fluorescent light fixtures in other rooms were grounded. This procedure was followed throughout the house to remove most of the electrostatic trouble.

The electromagnetic fields were much more of a problem because they can not be stopped with grounded shields of the ordinary type. Also grounding out static fields added more currents to the grounding system, adding more magnetic fields! The swimming pool was the best ground in the area, and strong currents were going to it so it was isolated from the house with insulating pipe bushings. Through the cooperation of the water and gas companies, the entrance pipes were isolated from the house. All of this reduced the pipe currents in the house.

The next line of attack was outside of the house. We asked the electric company if they would have a special transformer wound with an electrostatic shield between primary and secondary. This was done and they also cooperated in moving it further from the house. In the bottom of a creek bed below the power pole a six foot deep trench was dug about ten feet long in mostly rock. Sheets of copper were laid in the bottom and connected to heavy copper wire running to the pole transformer. Many bags of salt and charcoal were emptied into the hole and then it was filled with dirt. This was kept wet. The idea was to obtain the best possible ground that would be better than the house ground and remote from the house. The shield between primary and secondary of the transformer, and the case were connected to this ground. The secondary neutral was also connected.

This project resulted in the interception of the non-triple harmonics which could only get in through the capacity coupling in the transformer. The capaci-

tively coupled component of the triple harmonics were also intercepted and shunted to the new ground away from the house. This left only the inductively coupled component of the triple harmonics going to the house. These set up local conditions because the 240 volt center tap grounded system is split into two 120 volt circuits serving different parts of the house. Between the "hot" wires of the two circuits you have electrostatic conditions. For instance, the thermostat low voltage heating system controls were on one circuit, and the door chimes were on the other. Between these two open wire circuits there were strong electrostatic conditions. The thermostat and bell transformer secondary was grounded at one terminal to remove the static fields. Now the common ground was conducting these currents and setting up magnetic fields. It seems like you can't win! However, this was less than the overall noise level found around the whole house and property from more remote sources, so the next step was to track these down.

All of the water and gas lines in the area for many blocks around were checked with the coil.

Telephone lead cables and carriers were conducting high currents. Currents up to 5 amperes were measured in cables and pipes with clip around AC meters and by breaking pipe connections. The most valuable tool devised for this work was a portable automatic cycling switch or contactor with long heavy leads that could be clipped on to pipes or wires, to alternately make and break a cross connection or make and break certain pipe or wire disconnections. We would turn this on and then go back to the house to listen for changes in the noise. The interrupter was made so that the closed circuit period was longer than the open period so that we could tell which way the noise was loudest. Some of these effects were heard with the interrupter miles away. The subject in the house also noted these changes. A noise generator was also used with this switch to alternately add noise to a pipe etc.

During an electrical storm, the power to most of the city was knocked out for a few moments. I was at home when this happened. I went to the phone to call this woman to see what effect it had. Before I could call, she called me. She said that she was lying down resting when suddenly the noise stopped. She got up to see what happened and walked through the house. She was not aware that the electricity was off until she saw that the clock had stopped. The small amount of noise remaining during the power failure probably was coming from an insulated, high pressure gas main running from

Los Angeles to Goleta north of Santa Barbara. This line passes within 25 feet of the house and any pulsating DC cathodic pipe protection current would set up a field the same as alternating current. Pipe lines are protected from corrosion by electrolytic action by applying a low voltage DC current to the pipe of opposite polarity to the natural current so that iron ions do not leave the pipe to go to the soil, but ions from the soil go to the pipe. This current is supplied by rectified AC current units spaced at intervals along the line. Some of these units could have been outside of the power failure area.

Some incidental findings should be of interest to water and gas companies. I believe that AC currents may be a factor in pipe corrosion. It has been thought that only DC currents were a factor. I believe that AC currents could in certain possible ways find a path through the water in a pipe and, by electrolysis, break up the water into hydrogen and oxygen. The oxygen could very well be the cause of known pitting on the inside of water mains. In some cases you may have rectification of the AC currents due to oxides, corroded contacts or joints, or some condition that would create a rectifier. The DC then would present cathodic deterioration problems.

The last paragraph does not negate all the work done on this project. It should instead create a greater challenge. All of the work gradually brought the noise level down to a degree where the subject could live with what was left. The problem was complicated by the fact that continual changes were taking place in the area. New houses were built, new services were installed. New water lines and power lines were installed. The pattern of ground currents were changing. The noise kept increasing so that after a couple of years the tenants had to sell the house and find a quiet area.

## CONCLUSIONS

In this paper I have tried to show that this phenomenon of "Human Sensitivity to Electric Fields" can exist. I believe that the source of fields can be traced, the method of distribution can be determined and some measures can be taken to reduce them if the need exists. I believe that this whole field from the physiological to the engineering investigations requires competent attention by those qualified to do serious work on the subject.

## APPENDIX

A list of some of the equipment in this work would include the following: High gain battery operated amplifiers and tape recorders; A variety of electromagnetic coils and probes; A variety of

electrostatic probes and ground conduction probes; High pass, low pass, band pass and resonant tunable filters; Low frequency marine receiver; Oscilloscope; Signal generators; Noise generator; Megger; Harmonic wave analyzer and DB meter; Audiometer; Pen recorder; Clip around AC meters; A variety of special devices made for specific purposes and unusual conditions such as automatic sequential switching device. We also used a lot of heavy copper wire, electrostatic shielding and some special magnetic shielding material.

### ACKNOWLEDGMENT

May we say that we had the fullest cooperation of the utility companies. A lot of money was spent, and many hours of work put in by electric power crews, telephone crews, water company crews, and gas company crews. In order to break up pipe currents in the area, the gas and water companies cooperated in putting insulating bushings at the meters of most all the houses in the area. The water company even broke a high pressure 12 inch steel line at two places and installed insulating joints. This line ran between an upper and lower reservoir and was forming part of a large loop around the area. The electric company cooperated in making tests by disconnecting for brief periods some areas, by switching phases, by sending out engineers with special equipment to measure harmonics during tests such as shutting down rotary condensers at the substation. The phone company furnished a truck and a man to climb poles and measure and trace cable and cable carrier currents in the whole area. They also furnished components to experiment with resonant filters for the phoneline. The gas company furnished men with radio communication to make tests by turning off and on remote cathodic pipe protection units. Cooperative neighbors allowed me to go through their houses and properties with test equipment.

I hope that all of the findings on this project will in some measure compensate the cooperative companies for their material help. If this sort of case should arise again, I hope they can derive some help from what has been learned here. I am ready to cooperate with anyone wishing help.

I also want to thank the Biology staff at the University of California, Santa Barbara, for their cooperation and understanding.

### ADDENDUM

On June 14th 1963 I talked to the Monrovia woman on the phone. She thanked me for the proof I was able to give her that what she heard was a

real outside condition and not in her mind. Since this revelation she has been able to adjust herself to the noise.

On June 18th, after the ISA Symposium, I went to Santa Barbara and made a tape interview with the subject of this paper. She expressed her desire to cooperate in any way possible in further studies.

In this interview she mentions that a dog she had in this house could not stand the noise and became so ill he had to be destroyed. He always preferred a certain spot in the horse corral to stay in, the same spot the horse liked, also a spot she herself went to as it was much more quiet in regard to the field noises! This poses the possibility of using experimental animals in certain tests. Homing pigeons in races at times have been stranded on the house for days acting confused as to their bearings! It has been hard to understand their use of the DC earth field. However if they are sensitive to low frequency AC fields, movement of their wings in the steady earth magnetic field would induce AC currents in their body of the frequency of the wing beats. This could give them their bearings.

She also said that she encountered a strange condition in a friend's house. A certain hallway was completely quiet in a small area. This may have been a one in a thousand chance where the fields accidentally were in the right directions strength and phases to cancel out each other in a small spot. It would be unlikely that natural shielding would be able to do this.

We did make some attempts to do this in the previous work by picking up the noise, amplifying it, reversing the phase and injecting these fields into the house to try to cancel the existing field. Some mediocre effects were produced in this manner, but the variety of directions of many fields made it difficult to use this as a solution.

The subject at present is living in a location and house I would have picked with my equipment. The ground is damp and wooded instead of dry. It is on a steep hillside with no streets with pipes etc., below it. She is quite comfortable here.

The subject has also had another bad time with symptoms she had before from fields. She developed an infection in the ears and lost most all of her normal hearing for a time. AC field noise, however, did not diminish.

I am more convinced than ever that something should be done about these findings and so is the subject. She said that she considers herself fortunate that she could hear the noise because otherwise she would not have known what was causing her other conditions. She said the total body effect,

feeling, pain etc., is worse than the sound!

## ***A Guinea Pig Memorial***

**Name withheld by request**

About 1993 I bought two guinea pigs—Hattie and Cooter. These were healthy pigs and there were no overt health problems until the fall of 1995 after I moved the cage from my living room to a vestibule off the kitchen. Now they were on the floor about 10 feet from the refrigerator. Within 2 months, I noticed both pigs becoming a little less active. Within 5 months, Hattie had become very lethargic. Her health declined to the point of losing control of bladder and bowels, and dehydration. She eventually refused food and drink altogether and developed seizures right before she died. I remembered that both pigs seemed to have been drinking less water from the little water containers on the sides of the cage.

After a couple of months, I bought a new guinea pig, Lulu. She was just about 8 weeks old with no apparent health problems. Within a short time, I noticed she would sometimes jump up from the floor of the cage and shake her head vigorously from side to side. This movement appeared different from the jumping that guineas do when they get excited. She also became less interested in drinking water at times and fearful of being handled—unlike her personality when I got her. Meanwhile, there were no visibly dramatic changes in Cooter, although she'd become a little withdrawn.

Around this time, I had a dream in which my landlady told me electrical charges were coming from the floor, causing illness in my guinea pigs. When I woke up, I remembered hearing that electrically sensitive people can become symptomatic in proximity to refrigerators, due to electromagnetic emissions. I then suspected that the physical and behavioral effects in my guinea pigs correlated with EMF emissions from the refrigerator. This was my intuition and I trusted it. As it turned out, my gaussmeter measurements were "off the charts" in the area of the cage (10 feet in front of the refrigerator). (Editor's note: The magnetic field measured here was probably not from the refrigerator, but another source instead. ELF gaussmeters usually cannot measure refrigerator magnetic fields at 10 feet. ES symptoms from refrigerator EMFs at this distance and more can be due to harmonic frequencies above the ELF range and/or EMFs below the sensitivity

level of the meter.) Cooter and Lulu were immediately moved from this location to a significantly lower EMF-affected area of the house. Lulu stopped jumping and shaking and became less fearful of contact with me. Cooter remained lovable but withdrawn. I became more aware of my interaction with EMF sources in and outside of the kitchen.

I had always cleaned the cage on weekends. Now it became apparent to me that as moisture accumulated on the cage floor by the end of the week, the pigs drank little or no water from the water bottles when they had been in the kitchen area. I theorized that contact with the metal water container from the wet floor must have caused tiny shocks. The pigs would avoid the source of these jolts whenever moisture accumulated in the cage. Or, perhaps, there was a general wearing down of their immune systems, causing disease susceptibility or neurological "short circuiting". The whole thing reminded me of what I'd read about the effects of stray voltage on dairy cows.

I ultimately felt that I had been unknowingly conducting a laboratory experiment in my own kitchen. And the guinea pigs in this experiment had been, well...the guinea pigs!

I eventually had to give up my guinea pigs when I moved to a place where I could not have pets. I wonder about all the other pets in the world, not to mention their owners and friends who cannot protect themselves from harmful EMFs.

## **ENDNOTES**

- **Vermont Law School Conference-** Enclosed with this newsletter issue is a brochure announcing the November 15 - 16 EMF conference "Unplugged", by the Environmental Law Center, Vermont Law School, PO Box 96, South Royalton VT 05068-0096. This presentation will deliver both sides of the EMF debate, particularly as it relates to wireless technology.
- **Cellular Tower Controversy Profiled-**The EMR Alliance has compiled about 200 current news items from around the world detailing opposition to cellular tower placements. This cellular tower package provides an interesting overview of the cellular controversy in its early stages. The cellular tower package is available from the EMR Alliance, 410 W. 53rd St., Suite 402, New York NY 10019; cost \$15.

● **Update on New York City-Plans** for installing cellular antennas on New York City's lampposts appear to be moving ahead as scheduled, despite continued opposition. Some Community Boards in the City, which have political clout, are among those concerned about the health risks.

A media campaign by the Cellular Phone Task-force questioning the safety of these antennas yielded mention in the Staten Island Advance newspaper twice (Aug. 28 and Sept. 1, 1996), The Westsider (Sept. 26 - Oct. 2), and a WNBC TV interview during the evening news ("Live at Five", Aug. 30, 5:58 PM). The Westsider and the second article by the Staten Island Advance mentioned electrical sensitivity but the other media did not. Also, The New York Observer (Sept. 16) printed a letter to the editor from the EMR Alliance discussing the health risks.

A second project, requiring placement of PCS (digital cellular) antennas on New York City buildings every 10 blocks, also has some residents concerned. This project has a November, 1996 start date for operation with some antennas already in place. No public hearings have been scheduled by the City nor are any planned to address these issues.

● **NIOSH EMF and ES Information**-I recently contacted the National Institute for Occupational Safety and Health (NIOSH) requesting all the information this federal government agency would send about both electromagnetic fields and electrical sensitivity. I received a packet of articles on EMFs from medical and scientific journals, government publications, and magazines, all dated between 1988 and 1993. One booklet in the packet mentioned the subject of ES: "Questions and Answers About Electric and Magnetic Fields (EMFs)" by the U.S. Environmental Protection Agency (EPA), dated December 1992.

This booklet was written for the EPA staff, to educate them regarding public EMF inquiries and "...lists commonly asked questions and suggested answers...". Quoting from page 11, question III.5 states:

*"I can perceive electric and magnetic fields, what can I do?"*

*The following questions will often come up in this sort of a discussion.*

*Why is this?*

*Where is it coming from?*

*Are there other people like me?*

*What can I do?*

*My doctor can't help. Where else do I go?*

*Where do I find information?*

*Can you do something? ...make it stop?*

*I know its from \_\_\_\_\_(source). Can you make*

*them stop?*

*Generally, humans appear unable to sense or detect low levels of EMFs. Some animals have developed this capability and use it for detecting and capturing prey and possibly for navigating. Yet, since these abilities evolved in some animals, it is possible that biological systems have at least a very rudimentary ability to respond to such fields and some people may be more sensitive than others. Additionally, there are 'large' effects that can be detected, such as static charges making the fine hairs on the body stand up, dental work acting as radio receivers, induced body currents which might be felt (if large enough) and possibly effects which we have not yet documented. Some people report that they can 'sense' low-level EMFs, however, this subject has not been studied very much.*

*We don't have much advice for people who say they are sensitive to electric or magnetic fields. While grounding of sources might alleviate large static charges and dental work might reduce the radio effects, too little is known about the actual field-body interaction to suggest anything further in terms of mitigation."*

To obtain the free EMF packet from NIOSH, contact them at 1-800-356-4674; Address: NIOSH, Robert A. Taft Laboratories, 4676 Columbia Parkway, Cincinnati OH 45226-1998.

● **ES Network Member Healed**-In the New York City "HEAL" MCS newsletter, July 1996, a patient with severe MCS reported her story of being completely healed by prayer with the assistance of Pleasant Valley Ministries (PVM) in Georgia. Now others are reporting their healings too. Doreen Starks, an ES Network member, sent me her final newsletter, "Scripture Seeds for EI's", reporting on the healing in New York plus two more healings, including her own, through prayer and PVM.

For a copy of the newsletter, write to Doreen Starks, RR1, Box 118, 4th Gap Rd., Loganton PA 17747. Cost-US: \$1 plus a large self-addressed stamped envelope (55¢ stamp); outside the US: US \$1 plus US \$2 for postage. She recommended the Bible verse in Jeremiah 29:11-13 as one she likes to share.

The Ministry has a prayer line at 1-706-646-2058 (Monday through Saturday 6PM-11PM). Their address is Pleasant Valley Church and Ministries, 1519 Pleasant Valley Rd., Molena GA 30258. They do not correspond by mail due to their small number of staff, but do have a campground where some of the ill are staying.

• Happy Holidays! •

# ELECTRICAL SENSITIVITY NEWS

*An international newsletter about the latest environmental illness—electrical sensitivity from electromagnetic fields*

January - February 1997

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## ***Electromagnetic Hypersensitivity Among Members of the TCO Association***

**Docent Kjell Fransson, TCO Development Unit  
S-114 94 Stockholm, Sweden**

(Editor's note: The following article represents highlights of a 13-page report reviewing the results of the TCO labor union's November-December, 1995 survey. The complete report is available from TCO at the above address. Reprinted by permission. Copyright © 1996 by TCO.)

This article is a translation of a chapter entitled *Resultat och slutsatser* (Results and conclusions) from the TCO-report *Elöverkänslighet bland TCO-förbundens medlemmar* published in Stockholm 30th May, 1996.

### **Results and conclusions**

#### ***Questionnaire and raw data***

Many members of the TCO association (The Swedish Confederation of Professional Employees) claim that they suffer from electromagnetic hypersensitivity. We do not know how many they are. The tentative estimate made in the report *Elöverkänslighet bland SIFare, 1993* (A summary in English: *Electromagnetic Hypersensitivity - Results from a questionnaire Study among Swedish White Collar Workers about their Experiences*) remains a good proportional indication. This would mean that between 10,000 and 30,000 members of the TCO association consider themselves electromagnetically hypersensitive. In both this and the previous surveys, sufferers themselves had to come forward and describe their symptoms and situations, thereby defining the problem. It is important to listen to the

sufferers' subjective descriptions of how they experience the situation themselves; how it began, in what connection, what support they have received at the work place, etc. The common experience of hypersensitive sufferers must be the foundation and starting point on which trade union work, remedial measures, preventive measures and rehabilitation assistance must be based.

Electromagnetic hypersensitivity is a phenomenon that not only originates in working life but also continues to develop within the working environment. This phenomenon should be investigated and its extent mapped out in order to ensure the most effective countermeasures are devised, and also to correctly direct the applied research being initiated to try to develop scientifically-based models aimed at pinning down the connection between cause and effect.

Overall, the complete results material, 2,554 completed questionnaires from 11 different bodies associated with the TCO organisation, gives a rich and broad fund of information, even though many of the conditions are either vague or even unspecified. Each associate body will therefore group and analyse its own members' answers, with the final results being reviewed during the late summer of 1996. In addition to the associated bodies who have taken part in the study, SLF (Association of Forestal and Agricultural Employees) has carried out its own identical study. This will also form the basis of a report to be issued later this summer.

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**WARNING:** Environmental illness is a complex topic.

Methods or treatments that benefit some people may harm you. Readers are advised to consult appropriate medical, legal, or other professionals for personal guidance prior to making changes in their current program.

Note that no absolute statistical figures can be assumed from this study. The results are all derived from the 2,554 people who felt that they should complete the questionnaire.

#### Raw data

The raw material is excellent. The questionnaires were fully and carefully completed. Analysis of the answers has not revealed any results that lead to a suspicion that the collected raw material might have been affected by ancillary undesired factors. The divisions between age, length of time in the job and working hours are good and evenly spread, which made analysis easier. The division between the sexes was pronounced, with four times more women than men responding.

Note that in this report raw data is defined as data from questionnaires that have the effects of at least one symptom classified as "Very severe", "Severe" or "Negligible". This reduced the number of completed questionnaires from 2,554 to 2,335. **Gender and Age.** Compared with the total associated membership, twice as many women as men responded to the questionnaire, which in the end means four times as many responses from women as from men. This brings with it certain statistical limitations when comparing between women and men. The averages for age, length of time that symptoms have been present, number of years working with displays and number of daily working hours at the display show that women have had longer and more intensive experience of working with displays than men. It follows naturally that women have also suffered symptoms longer than men.

The figures are not true values but must be seen in comparison with other mean values, i.e. they are relative.

Variable	Mean Values	Women	Men
Age	45.1 years	45.3 years	44.0 years
Time with symptoms	4.2 years	4.3 years	3.9 years
Time working with displays	5.9 years	5.9 years	5.5 years
Time spent at the display	4.8 hrs/day	5.0 hrs/day	4.5 hrs/day

There is a remarkably high mean value for the number of hours per day spent at the display stated by hypersensitive people. In trade union terms, four hours per day has been a limit, beyond which measures should be taken to investigate work content and job organisation.

**Symptoms.** The responses show that the different symptoms in the health information were well specified, as was the graduation of symptom severity. The respondents were able to understand the differences between "Very severe, Severe, Negligible and None". Of the 2,335 answers, 1,811 people (78%) claimed "Very severe" or "Severe" symptoms in at least one of the 13 symptom areas. In the report we have used both these answers as a definition of having symptoms.

In working life in general back and shoulder pains are the most common physical problems in clerical workers and are twice as common as eye irritation. The highest incidence of symptoms is in the office workers group, among those who only work with data entry. The repetitious and routine character of data entry, together with possible immovable working posture probably explains this situation.

Eye irritation among clerical workers in general is common for those who spend their entire working time processing text or data, which presumably depends on the fact that such tasks require a higher degree of concentration. Eye irritation is also a commonly suffered physical condition.

Among hypersensitive people the *Eye* and *Skin* symptoms have the highest response frequency, and *Pain in joints* comes third. It can only be assumed that this investigation into electromagnetic hypersensitivity does not reflect the usual physical problems within working life. On the other hand, it is possible that people with physical problems could consider themselves hypersensitive, and therefore answered the questionnaire.

It should be noted that the *Mouth* symptom, which is often associated with amalgam-related problems, in respect of electromagnetic hypersensitivity has the lowest rate in the survey. We cannot however go so far as to say that there is no connection between electromagnetic hypersensitivity and amalgam-related problems.

In comparison with the 1993 survey the symptoms *Breathing* and *Dizziness* have shown the greatest relative increase. Women show the same result and the increase in men is in the symptom *Pain in face* and *Facial aches*. The minimum relative change is in *Pain in joints*, as far as women are concerned, whereas for men *Nose* is the symptom with the smallest increase.

The first symptom indicates two entrances leading to electromagnetic hypersensitivity, namely *Eyes* and *Skin*. *Nose* and *Pain in joints* are other symptoms complained of that appear to lead to further suffering.



**Equipment.** The electrical equipment/environment pointed out as the one initiating the problem are work with PC/terminal/display, that represents 63% of the responses, and the introduction/exchange of these stand for another 7%. Only the fluorescent tube lamps + PC/terminal/display has equal representation (6%). Note that the mention combination of fluorescent tube lamp + PC/terminal/display has a notably higher value than fluorescent tube lamps + introduction of fluorescent tube lamps together. Those who point to just fluorescent tube lamps, filament lamps or lighting in general as initiators of problems are only represented by 2% of the responses. This is not to say that many people may suffer problems due to fluorescent tube lamps, filament lamps or lighting in general, but it appears that electromagnetic hypersensitivity is not initiated by this type of equipment.

#### Connection between Gender and Age/Job

There is a clear preponderance of women in the age range 46 to 55, and of men between 26-35 and 56-65. The differences between women and men balance against each other so that the medians are reasonably equal. A comparison between age and gender among each separate association's members will appear in the respective bodies' reports.

Responses from electrically hypersensitive people show that women have 6 months longer experience of working with computer displays than men, while women also work half an hour longer each day in front of displays than men.

#### Health information and Gender/Age/Job tasks

For younger women *Skin* and *Eyes* are the most common symptoms, and for older women *Eyes* and *Pain in joints* dominate. When comparing younger and older women, *Skin* symptoms are most prevalent in younger women but also often appear in all ages. *Pain in face* and *Mouth* are symptoms especially associated with older women.

Among men *Skin* is the dominating symptom for both age groups while *Pins and needles* is least apparent in younger men, and *Breathing* among the older. The symptom that is in highest proportion between younger and older men is *Skin*, closely followed by *Eyes*, *Headache* and *Dizziness*. In older men *Pins and needles* dominates.

The highest prevalence of symptoms in younger women and men is the same as for those pointed out as the first symptoms at the onset of electromagnetic hypersensitivity.

The connections between the 13 symptoms and

age, number of years spent doing work at displays and number of hours per day at the display are reviewed below:

- *Nose* is only connected with age.
- *Mucous membrane* is only connected to the number of years doing display work.
- *Eyes* is only connected to the number of hours per day in front of the display.
- *Mouth* and *Pain in face* are both linked to age and number of years spent doing display work, but are not linked to the number of hours per day in front of the display.
- *Pain in joints* is connected with age and the number of hours per day in front of the display, but is not linked to the number of years spent doing display work.
- *Skin*, *Facial aches*, *Dizziness*, *Headaches* and *Tiredness* are linked to both the number of years and the number of hours per day in front of the display, but are not connected with age.
- *Pins and needles* and *Breathing* are connected to all three variables.

The first symptom also shows differences between women and men. Four symptoms have a difference of more than three times the standard deviation. Women have more *Pain in joints* and *Nose*, men more *Skin* and *Eyes*. Women have in addition named more symptoms as the primary symptoms than men.

Information about the main symptom changes with time and is dependent on how many years it has been since the electromagnetic hypersensitivity began. Note that all the respondents to the questionnaire consider themselves to have electromagnetic hypersensitivity. Those who have received help and do not consider themselves to suffer from electromagnetic hypersensitivity any longer have not completed the questionnaire.

The result is that the *Eye* (and *Mucous membrane*) symptoms decrease as more years pass, which means that these people are receiving help for their electromagnetic hypersensitivity. The symptom *Nose* increases with the years, meaning that this condition was not classified earlier by sufferers as electromagnetic hypersensitivity in its initiating period, but had other explanations. Another observation is that the sum of the probably overlapping symptoms *Skin* and *Facial aches* is constant up to 4 years, increasing rapidly at 8 years and falling under the median at more than 8 years of suffering.

The number of respondents who have described several initial symptoms also increases with time, which is not so unusual. Note however that these



require space in the 100% that makes up the normalisation.

### Measures and Age/Gender

Women show themselves to be more active in respect of the measures "Have you reported your problems as a work-related injury to your National Insurance office?" and "Are you undergoing any form of rehabilitation?". More women than men answered "Yes", which conforms to the picture of women having a greater number of symptoms.

All measures neatly correlate to age dependence, as expected, i.e. the problems increase with time. It is a little surprising that more are not undergoing rehabilitation despite having reported their problems as work-related injuries to the National Insurance office. In the age group 36 to 65 years (83%) only half the number of those who have reported work-related injury to the National Insurance office are being rehabilitated. It may be however that rehabilitation has finished.

### Number of symptoms per individual

Five hundred and twenty-four out of 2,335 people judged their problems to be only "Negligible" or "None" for the 13 possible symptoms contained in the questionnaire. Five hundred eighteen people had 7 or more of the symptoms. Comparing the results of 9-13 symptoms with 1-2 symptoms, one finds that women are 3.5 times more heavily represented in the interval with a greater number of symptoms.

### Number of symptoms and Gender/Age

The median value of women is 4.5 symptoms, and for men 2.5 symptoms. Women had more symptoms than men, being twice as heavily burdened (65%).

### Measures related to the Number of symptoms and Gender

The results were as follows, with the percentage referring to the group who have reported that they have at least one symptom.

● **Do the symptoms wear off when you are not at work?** Yes, already with one symptom the "Yes" response is in the absolute majority, i.e. greater than both the "No" and "Don't know" answers combined. The "Yes" responses are in the interval 70-87% and the proportion of "Yes" answers increases with the number of symptoms. Women have in general a larger proportion of "Yes" answers than men, and men have a larger proportion of

"Don't know" responses.

● **Do you experience similar problems at home?** The proportion of "Yes" responses grows with the number of symptoms, but "Yes" only becomes highest at 10.5 symptoms. Men have a tendency to reach this point rather earlier. For this question too, women generally have a larger proportion of "Yes" answers than men, and men have a larger proportion of "Don't know" responses.

● **Has anything been done at your workplace because of your problems?** The "Yes" answers are always fewer than the "No" answers, both for women (42%) and men (40%).

## Terminal Illness

Lawrence R. Feldman, M.D., William H. Eaglstein, M.D., and Robert B. Johnson, M.D. - USA

(Editor's note: The article entitled "Terminal Illness" is reprinted from the Journal of the American Academy of Dermatology under Correspondence, Volume 12, 1985, page 366. Reprinted by permission. Copyright © 1985 by Mosby-Year Book, Inc.)

The introduction of new processes and technologies often produces new dermatologic entities. As we pass from an industrial and into a high technologic society, we become more familiar with problems unique to this generation. One new phenomenon is the burgeoning use of personal computers with their visual display units. We report the case of a patient who presented with a puzzling dermatitis that we feel was caused by exposure to his visual display unit at work.

A 33-year-old white man had a 15-month history of redness, burning, and itching of the dorsa of both hands and the distal aspects of the forearms. He noted this eruption 2 weeks after starting a new job working at a computer terminal, with the visual display unit emissions falling on his hands and forearms. The symptoms improved considerably on the weekends when he was away from work. Furthermore, when he covered one hand with Duoderm while at work, this area remained clear. There was no relationship between the dermatitis and any systemic medication he was receiving. Various topical steroids were applied without improvement. He was admitted to Presbyterian-University Hospital for diagnostic assessment in February 1984.